ConnectX®-2 EN Dual Port SFP+ Ethernet Adapter Card User Manual

P/N:
MNPH29C-XSR, MNPH29C-XTR, MNPH29D-XSR, MNPH29D-XTR
Rev 1.6

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ConnectX-2 Ethernet Card User Manual

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Revision History

This document was printed on 2/15/11.

Table 1 - Revision History Table

Date	Rev	Comments/Changes
Jan. 2011	1.6	Changed Air flow requirement Added to the Set up section
Dec. 19th, 2010	1.5	Minor formatting changes
Nov. 22nd, 2010	1.4	Added Generation D card Mini Form Factor
Oct. 28th, 2010	1.3	Added Technical Support and Firmware and Software Updates sections to the Preface section Added RoCE Added ConnectX EN PXE Added Set up section, This is a sanity check after card installation. Added KCC statement to Appendix A Added QSFP to SFP+ QSA adapter Removed Gen 1 cards Formatted EMC table Changed EN 60950-1: 2001 to EN 60950-1: 2006 Changed RDMA over Ethernet Added RDMA over Ethernet New template
April 2010	1.2	New power numbers
Feb. 2010	1.1	Added Section on PXE boot
Feb. 2010	1.0	Initial Release

About this Manual

This *User Manual* describes Mellanox Technologies ConnectX®-2 Dual Port 10Gigabit Ethernet PCI Express x8 adapter cards. It provides details as to the interfaces of the board, specifications, required software and firmware for operating the board, and relevant documentation.

Intended Audience

This manual is intended for the installer and user of these cards.

The manual assumes basic familiarity with Ethernet networks and architecture specifications.

Related Documentation

Table 2 - Documents List

Mellanox Firmware Tools (MFT) User Manual Document no. 2204UG	User Manual describing the set of MFT firmware management tools for a single node. See http://www.mellanox.com => Firmware & Downloads => Download Firmware Tools Or http://www.mellanox.com => Support => Download Firmware Tools
IEEE Std 802.3 Specification	This is the IEEE Ethernet specification http://standards.ieee.org/getieee802
PCI Express 2.0 Specifications	Industry Standard PCI Express 2.0 Card Electromechanical Specification, Rev 1.3.

Online Resources

- Mellanox Technologies Web pages: http://www.mellanox.com
- Mellanox Technologies Firmware download Web page: http://www.mellanox.com =>

Document Conventions

When discussing memory sizes, MB and MBytes are used in this document to mean size in mega bytes. The use of Mb or Mbits (small b) indicates size in mega bits.

Technical Support

Customers who purchased Mellanox products directly from Mellanox are invited to contact us through the following methods.

- URL: http://www.mellanox.com => Support
- E-mail: support@mellanox.com

- Tel: +1.408.916.0055

Customers who purchased Mellanox M-1 Global Support Services, please see your contract for details regarding Technical Support.

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Firmware and Software Updates

The Mellanox support downloader contains software, firmware and knowledge database information for Mellanox products. Access the data base from the Mellanox Support Web page,

http://www.mellanox.com=>Support

or use the following link to go directly to the Mellanox Support Download Assistant page,

http://www.mellanox.com/supportdownloader/.

1 Overview

This document is a *User Manual* for Mellanox Technologies cards based on the ConnectX®-2 ENintegrated circuit device. The cards described in this manual have the following main features:

- IEEE Std 802.3 compliant
- 10 Gb/s Ethernet
- Dual SFP+ ports for connection Ethernet traffic
- PCI Express 2.0 (1.1 compatible) through an x8 edge connector up to 5GT/s
- Fiber Channel encapsulation (FCoE)
- RDMA over Converged Ethernet (RoCE)
- RoHS-R6
- Two bracket heights: short and tall

1.1 Adapter Cards Covered in this Manual

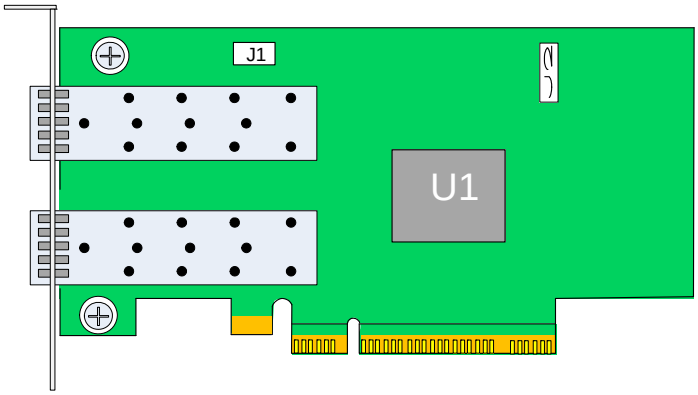
Table 3 lists the Ethernet adapter cards described in this manual.

Table 3 - Network Interface Cards

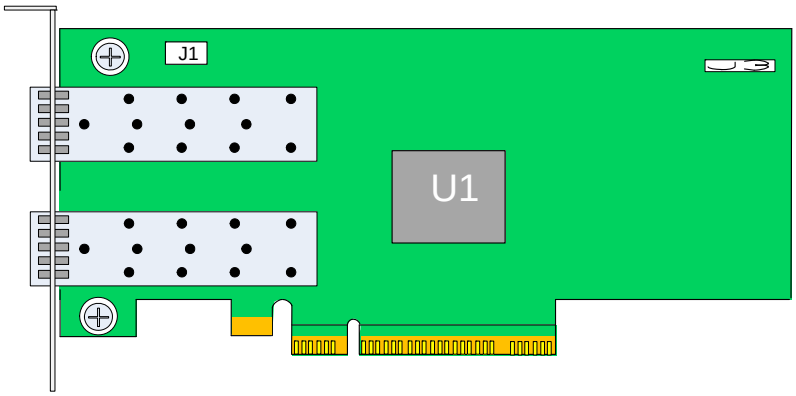
Ordering Part Number (OPN)	PCI Express SERDES Speed	Data Transmission Rate/ # of ports	Short / Tall Bracket	RoHS	Adapter IC Part Number
MNPH29D-XTR	PCIe Gen2 5.0 GT/s	10 +10 Gb/s Ethernet 2 ports	Tall	R-6	MT25408B0-FCCR-TE
MNPH29D-XSR	PCIe Gen2 5.0 GT/s	10 +10 Gb/s Ethernet 2 ports	Short	R-6	MT25408B0-FCCR-TE
MNPH29C-XTR	PCIe Gen2 5.0 GT/s	10 +10 Gb/s Ethernet 2 ports	Tall	R-6	MT25408B0-FCCR-TE
MNPH29C-XSR	PCIe Gen2 5.0 GT/s	10 +10 Gb/s Ethernet 2 ports	Short	R-6	MT25408B0-FCCR-TE

Figure 1: SFP+ NIC Component Side and Bracket Views

MNPH29D



MNPH29C



1.2 Mellanox Part Numbering Legend

Table 4 describes the Mellanox Technologies adapter cards part numbering legend.

Table 4 - Mellanox Cards Part Numbering Key

Adapter Card OPN MHTS#I-XBR	Field	Decoder
M	Mellanox Technologies	
H	Adapter Type	H = InfiniBand Host Channel Adapter, N = Ethernet Network Interface Card
T	Media	P = SFP+,
S	Adapter Architecture	H = ConnectX®or ConnectX-2
#	# ports	1 = 1, 2 = 2
I	Host Interface	X = PCI-X, 4 = PCIe x4, 8 = PCIe Gen1 x8, 9 = PCIe (Gen2 x8),
G	Generation	<blank> = Initial product generation, B= generation B, C= generation C
-	Separator	
X	Memory Size	X = MemFree, 1=128MB, 2=256MB, 3=512MB
B	Bracket	S = Short, T = Tall, N = None
R	RoHS	<blank> = non RoHS, C = RoHS R-5 w/ Exemption, R = RoHS R-6 Lead-Free

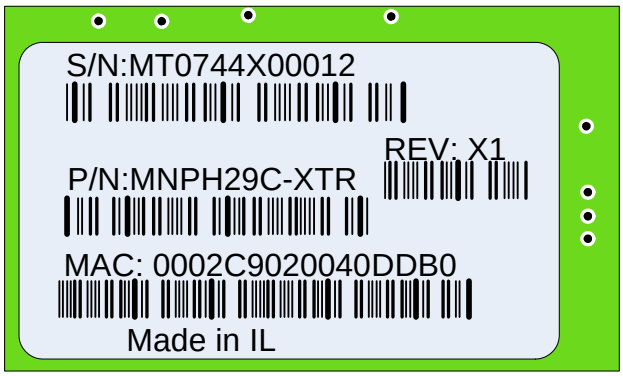
For example, the part number MNPH29C-XTR describes Mellanox Technologies' ConnectX EN adapter card with two SFP+ ports, a PCIe2.0 x8 5.0GT/s interface, no on-board memory (mem-free), a tall bracket, and RoHS R6 compliance. Using the legend,

- field M = M to indicate a Mellanox Technologies product,
- field H = N to indicate a Network Interface Card,
- field T = P to indicate 10GBASE-SR/LR,
- field S = H to indicate ConnectX
- field # = 2 to indicate two ports,
- field I = 9 to indicate PCI Express 2.0 x8 running at 5.0GT/s,
- field G = C to indicate Generation C ConnectX-2
- field X = X to indicate no on-board memory,
- field B = T to indicate a tall bracket, and
- field R = R to indicate RoHS R6 compliance

1.3 Finding the MAC and Serial Number on the Adapter Cards

All Mellanox adapter cards have a label on the printed side of the adapter card that has the card serial number, and the card MAC.

Figure 2: Card Product Label



Port 1 uses the GUID or MAC ID described on the label, for port 2 GUID or MAC add 1 to port 1's description.

1.4 Safety Warnings

For safety warnings in French see “Avertissements de sécurité d’installation (Warnings in French)” on page 45. For safety warnings in German see “Sicherheitshinweise (Warnings in German)” on page 46. For safety warnings in Spanish see “Advertencias de seguridad para la instalación (Warnings in Spanish)” on page 47.

1. **Installation Instructions**

Read all installation instructions before connecting the equipment to the power source.

2. **Over-temperature**

This equipment should not be operated in an area with an ambient temperature exceeding the maximum recommended: 55°C (131°F).
To guarantee proper air flow, allow at least 8cm (3 inches) of clearance around the ventilation openings.

3. During Lightning - Electrical Hazard

During periods of lightning activity, do not work on the equipment or connect or disconnect cables.

4. Copper Cable Connecting/Disconnecting

Some copper cables are heavy and not flexible, as such they should be carefully attached to or detached from the connectors. Refer to the cable manufacturer for special warnings and instructions.

5. Equipment Installation

This equipment should be installed, replaced, or serviced only by trained and qualified personnel.

6. Equipment Disposal

Disposal of this equipment should be in accordance to all national laws and regulations.

7. Local and National Electrical Codes

This equipment should be installed in compliance with local and national electrical codes.

2 Adapter Card Interfaces

2.1 I/O Interfaces

Each card includes the following interfaces:

- SFP+ ports
- I/O panel LEDs
- I^2C compatible connector (for debug)

For dual port cards, port 1 connects to connector 1 of the device, while port 2 connects to connector 2 of the device.

ConnectX-2 Ethernet Adapter Cards are compliant with the IEEE Std 802.3 Specification.

Figure 3: Port Numbering

2.1.1 Ethernet SFP+ Interface

The ConnectX®-2 device is compliant with the *IEEE Std 802.3.* The SFP+ port has one Tx/Rx pair of SerDes.Ethernet NIC cards listed in Table 3 on page 11 based on this device provide access to the Ethernet ports by means of SFP+ connectors.

2.1.2 PCI Express Interface

The ConnectX-2 adapter cards support PCI Express 2.0 (1.1 compatible) through an x8 edge connector. The device can be either a master initiating the PCI Express bus operations or a slave responding to PCI bus operations.

2.1.3 LED Assignment

The board has I/O LEDs located on the I/O panel. The green LED, when lit, indicates that the driver is running and a valid physical connection between nodes exists. If the green LED is blinking, it indicates a problem with the physical link. The yellow LED when lit, indicates a valid data activity link, this is the logical link. The yellow LED lights up when the network is discovered over the physical link. A valid data activity link without data transfer is designated by a constant yellow LED indication. A valid data activity link with data transfer is designated by a blinking yellow LED indication. If the LEDs are not active, either the physical link or the logical link (or both) connections have not been established.

Figure 4: LED - Port Association

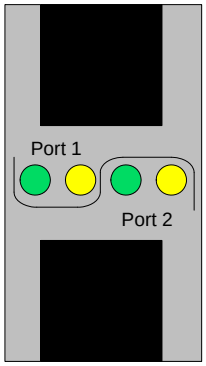


Figure 5: Physical and Logical Link Indications

Table 5 - LEDs

Port Number	LED Name
Port 1	Physical Link - Green Constant on indicates a good physical link Blinking indicates a problem with the Physical link
	Data Activity - Yellow Blinking indicates Data Transfer Constant on indicates no Data Transfer
Port 2	Physical Link - Green Constant on indicates a good physical link Blinking indicates a problem with the Physical link
	Data Activity - Yellow Blinking indicates Data Transfer Constant on indicates no Data Transfer

The short bracket has the same port and LED footprint as the tall bracket.

2.1.4 I²C Compatible Interface

A three-pin header on the card is provided as the I²C compatible interface. See Appendix A,"Specifications," on page 34 for the location on the board.

Figure 6: I²C Connector

2.2 Power

All adapter cards receive 12V and 3.3V power from the PCI Express Edge connector. All other required power voltages are generated by on-board switch mode regulators. See "Specifications" on page 34.

2.3 Memory

The adapter cards support multiple memory devices through the PCI Flash, and I2C.

2.3.1 System Memory

The card utilizes the PCI Express interface to store and access Ethernet fabric connection information and packet data on the system memory.

2.3.2 Flash

Each of the cards include one SPI Flash device accessible via the Flash interface of theMT25408B0 ConnectX-2 EN device.

There is a jumper on each adapter card that indicates to the device whether an on-board Flash device is to be used. Table 6 provides information on this jumper. See the schematic in Appendix A,"Specifications," on page 34 for the jumper location.

Table 6 - Jumper Configuration

Description	Option	Card Default Configuration	Comments
Flash present/ not present	connection open – Flash present connection shorted – Flash not present ***Figure 7: Flash Jumper*** 	connection open – Flash present	Header 1x2

2.3.3 EEPROM

Each board incorporates an EEPROM that is accessible through the I2C. The EEPROM is used for storing the Vital Product Data (VPD). The EEPROM capacity is 4Kb.

2.4 VPD Layout

The PCI VPD (Vital Product Data) layout, for each of the described Mellanox Technologies ConnectX®-2 adapter cards complies with the format defined in the *PCI 2.3 Specification, Appendix I*. All ConnectX-2® adapter cards have the same PCI VPD layout.

Table 7 - VPD Layout for MNPH29D-X[ST]R

Offset (Decimal)	Item	Value	Format	Description
0	Large Resource Type ID String Tag (0x02)	0x82		
1	Length [7:0] LSB	0xE		
2	Length [15:8] MSB	0x0		
3	Data	Hawk Dual Port	STR	
17	Large Resource Type VPD-R Tag (0x10)	0x90		
18	Length [7:0] LSB	0x4F		
19	Length [15:8] MSB	0x00		
20	VPD Keyword	PN	STR	Add in Card Part Number
22	Length	0x15		
23	PN	PN	%STR_SPC	
44	VPD Keyword	EC	STR	Engineering Change Level of the card (rev)
46	Length	0x2		
47	Revision	RV	%STR	PCB revision
49	VPD Keyword	SN	STR	Serial Number
51	Length	0x18		
52	SerialNumber		%STR_SPC	“00..00XXXX..XX”

Table 7 - VPD Layout for MNPH29D-X[ST]R

Offset (Decimal)	Item	Value	Format	Description
76	VPD Keyword	V0	STR	Misc Information
78	Length	0x10		
79	Data	PCIe Gen2 x8	STR_SPC	
95	VPD Keyword	RV	STR	
97	Length	0x1		
98	Data	0,97	%CS0	
99	Large Resource Type VPD-W Tag (0x11)	0x91		
100	Length [7:0] LSB	0x99		
101	Length [15:8] MSB	0x00		
102	VPD Keyword	V1	STR	EFI Driver version
104	Length	0x6		
105	Data	N/A	STR_SPC	
111	VPD Keyword	YA	STR	Asset Tag
113	Length	0x20		
114	Data	N/A	STR_SPC	“N/A”
146	VPD Keyword	RW	STR	Remaining read/write area
148	Length	0x6A		
149	Data		STR_ZERO	Reserved (0x00)
255	Small Resource Type END Tag (0x11)	0x78		

Table 8 - VPD Layout for MNPH29C-X[ST]R

Offset (Decimal)	Item	Value	Format	Description
0	Large Resource Type ID String Tag (0x02)	0x82		
1	Length [7:0] LSB	0xE		
2	Length [15:8] MSB	0x0		
3	Data	Hawk Dual Port	STR	
17	Large Resource Type VPD-R Tag (0x10)	0x90		
18	Length [7:0] LSB	0x4F		
19	Length [15:8] MSB	0x00		
20	VPD Keyword	PN	STR	Add in Card Part Number
22	Length	0x15		
23	PN	PN	%STR_SPC	
44	VPD Keyword	EC	STR	Engineering Change Level of the card (rev)
46	Length	0x2		
47	Revision	RV	%STR	PCB revision
49	VPD Keyword	SN	STR	Serial Number
51	Length	0x18		
52	SerialNumber		%STR_SPC	“00..00XXXX..XX”

Table 8 - VPD Layout for MNPH29C-X[ST]R

Offset (Decimal)	Item	Value	Format	Description
76	VPD Keyword	V0	STR	Misc Information
78	Length	0x10		
79	Data	PCIe Gen2 x8	STR_SPC	
95	VPD Keyword	RV	STR	
97	Length	0x1		
98	Data	0,97	%CS0	
99	Large Resource Type VPD-W Tag (0x11)	0x91		
100	Length [7:0] LSB	0x99		
101	Length [15:8] MSB	0x00		
102	VPD Keyword	V1	STR	EFI Driver version
104	Length	0x6		
105	Data	N/A	STR_SPC	
111	VPD Keyword	YA	STR	Asset Tag
113	Length	0x20		
114	Data	N/A	STR_SPC	“N/A”
146	VPD Keyword	RW	STR	Remaining read/write area
148	Length	0x6A		
149	Data		STR_ZERO	Reserved (0x00)
255	Small Resource Type END Tag (0x11)	0x78		

3 Driver Software and Firmware

3.1 Driver Software

3.1.1 Linux

For Linux, download and install the latest MLNX_EN driver software package available via the Mellanox Web site at:
http://www.mellanox.com => Downloads => Ethernet SW/Drivers. Follow the installation instructions included in the download package.

3.1.2 Windows

For Windows, download the MLNX EN – Ethernet driver. Download this package from the Mellanox Web site at:
http://www.mellanox.com => Downloads => Ethernet SW/Drivers. Follow the installation instructions included in the download package.

3.2 RDMA over Converged Ethernet (RoCE)

ConnectX-2 EN with RoCE utilizes advances in Data Center Bridging (DCB) to enable efficient and low cost implementations of RDMA over Ethernet, supporting the entire breadth of RDMA and low latency features. This includes reliable connected service, datagram service, RDMA and send/receive semantics, atomic operations, user level multicast, user level I/O access, kernel bypass, and zero copy.

ConnectX-2 EN with RoCE based network management is the same as that for any Ethernet and DCB-based network management, eliminating the need for IT managers to learn new technologies.

3.2.1 Hardware and Software Requirements

Software:

Operating System

- Mellanox OFED 1.5.1 or later

Hardware:

- ConnectX-2 EN Adapter Card

To use RoCE you will need the following versions of firmware and software:

- OFED 1.5.1 or later
- firmware version 2.7.700 or later

3.2.2 Installation

For installation instructions visit: www.mellanox.com => Support => Ethernet SW/Driver

3.3 Updating Card Firmware

Each card is shipped with the latest version of qualified firmware at the time of manufacturing. Firmware is updated occasionally, and the most recent firmware can be obtained from: http://www.mellanox.com =>Support > Download Center. Check that the firmware on your card is the latest found on the Mellanox site, if not update to the latest version found on the Mellanox website.

Firmware can be updated on the stand alone single card using the **flint** tool of the *Mellanox Firmware Tools (MFT)* package. This package is available for download, along with its user manual, from the Mellanox Firmware Tools page. See http://www.mellanox.com => Support > Download Center.

A firmware binaries table lists a binary file per adapter card. The file name of each such binary is composed by combining the firmware name, the firmware release version, and the card part number. Please contact Mellanox system support if you cannot find the firmware binary for your adapter card.

To check the latest firmware:

1. Go to Mellanox web site to check current firmware version.
   Go to: http://www.mellanox.com/supportdownloader
2. Enter your card PSID and compare the firmware versions.

Figure 8: Support Download Assistant

3.4 ConnectX EN PXE

The Mellanox ConnectX EN PXE solution enables the booting of servers from an IP based LAN environment.

To enable or disable PXE use the following procedure:

The user must use the MFT tools:

To disable one must delete the PXE ROM image from the flash.

To enable one must place the PXE ROM image to the flash.

This software is based on the open source Etherboot/gPXE project (see www.etherboot.org).

For more details go to http://www.mellanox.com Products => Ethernet SW/Drivers > ConnectX EN PXE.

4 Ethernet Adapter Card Installation

4.1 Hardware and Software Requirements

Before installing the adapter card, please make sure that the system meets the hardware and software requirements listed in Table 9. Refer to Chapter 3,“Driver Software and Firmware” on page 22 for download and installation instructions.

Table 9 - Hardware and Software Requirements

Requirement	Description
Hardware	• PCI Express x8 or x16 slots
Firmware and Software Operating Systems/Distributions	• For the latest firmware available please check http://www.mellanox.com => Downloads => Firmware **Management Tools and Drivers** • Mellanox management tools can be found at: http://www.mellanox.com => Downloads => Firmware Tools • Linux Driver for ConnectX EN Based Network Interface Cards with 10GigE Support can be found at: http://www.mellanox.com => Downloads => Ethernet SW/Drivers • Windows Driver for ConnectX EN Based Network Interface Cards with 10GigE. Support can be found at: http://www.mellanox.com => Downloads => Ethernet SW/Drivers • Mellanox Ethernet Driver for Citrix XenServer 4.1, Mellanox ConnectX EN 10GbE Dual port NIC Support can be found at: http://www.mellanox.com => Downloads => Ethernet SW/Drivers

4.2 Installation Instructions

To change a tall bracket to a short bracket see Replacing a Tall Bracket With a Short Bracket on page 43.

Read all installation instructions before connecting the equipment to the power source.

The adapter cards listed in Table 3 on page 11 are standard PCI Express cards, each with a standard x8 edge connector. Please consult the host machine documentation for instructions on how to install a PCI Express card.

When more than one PCI slot is available make sure to use the PCI slot with the proper configuration.

Any PCI slot with the proper configuration is acceptable for connection. If the card is installed in a PCI slot with less lanes than the card requires then the adapter card will not provide the optimum data transfer.

4.3 Set Up

This section is valid for InfiniBand, Ethernet and VPI cards. Disregard sections that are not relevant to your card.

The basic steps to embed Mellanox cards in your computer are:

1. Identify the card in your system.
2. Verify the computer is recognizing the new adapter.
3. Install the adapter drivers.
4. Update the adapter firmware if needed.

The configuration of the card is dependant upon your choice to use InfiniBand or Ethernet.

4.3.1 Identify the Card in Your System

For instructions to identify your adapter card using specific tools see http://www.mellanox.com/content/pages.php?pg=firmware_HCA_FW_identification

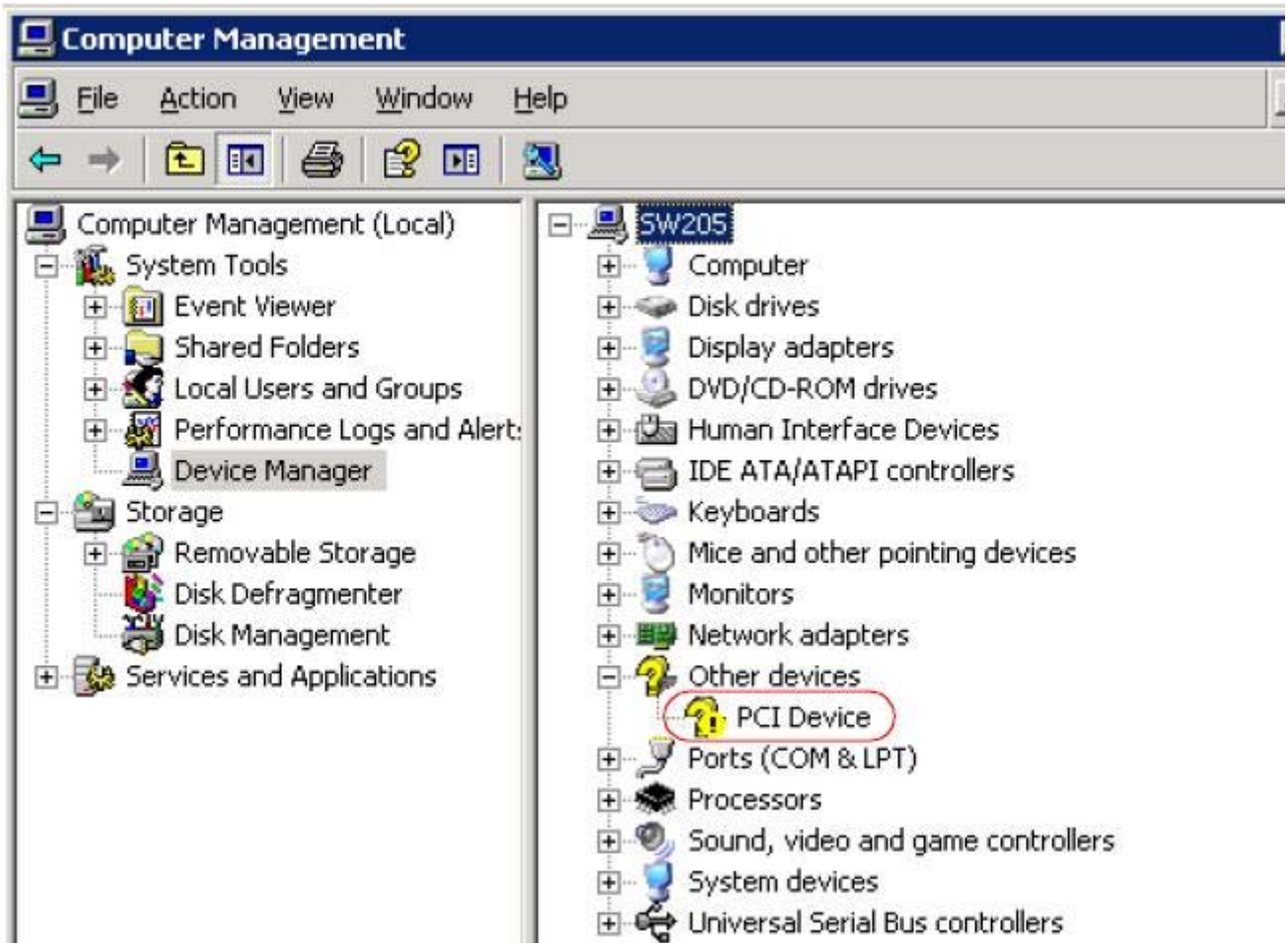
Otherwise, use the instructions below relevant to your particular card and OS.

4.3.1.1 Windows

1. Open Device Manager. Click start--> Run, and then enter “devmgmt.msc”.
2. Check the Device Manager under “Other devices” for “PCI Device” (Windows 2003) or “InfiniBand Controller” (Windows 2008/R2).

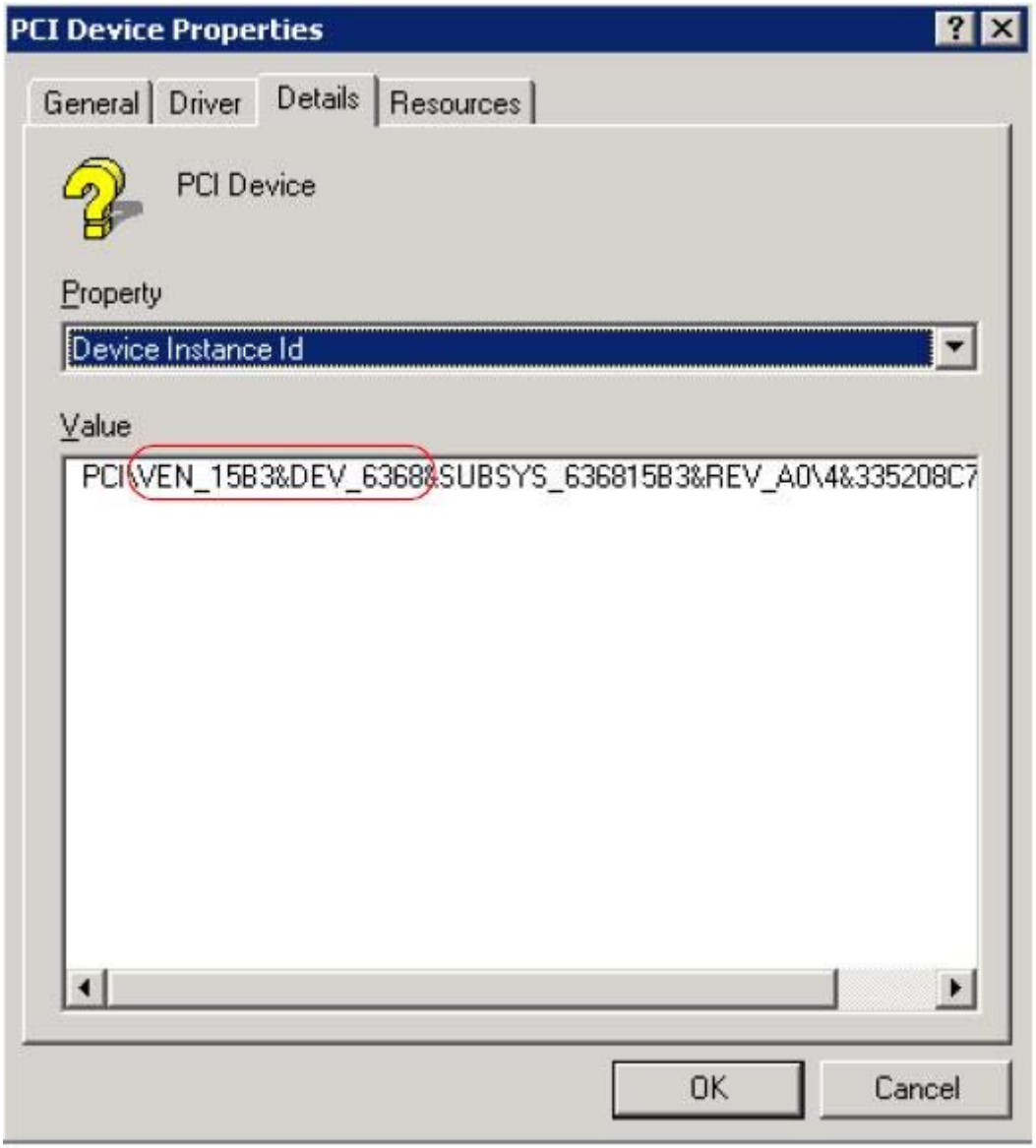
If you cannot find any PCI device, click Action --> Scan for hardware changes. If no PCI devices are detected, check that the network adapter card(s) is correctly installed in the PCI slot or try installing the adapter card into a different PCI slot.

Figure 9: Hardware Devices



3. Select a PCI Device / InfiniBand Controller entry.
4. Right-click.
5. Select "**Properties to display the PCI Device Properties**" window.
6. Click the Details tab and select **Device Instance Id** (Windows 2003) or **Hardware Ids** (Windows 2008/R2) from the Property pull-down menu.

Figure 10: PCI Device



7. In the Value display box, check the fields VEN and DEV (fields are separated by '&'). In the display example above, notice the sub-string "PCI\VEN_15B3&DEV_6368": VEN is equal to 0x15B3 – this is the Vendor ID of Mellanox Technologies; and DEV is equal to 0x6368 – this is a valid Mellanox Technologies PCI Device ID.

The list of Mellanox Technologies PCI Device IDs can be found in the PCI ID repository at http://pci-ids.ucw.cz/read/PC/15b3.

8. If the PCI device does not have a Mellanox adapter ID, return to Step 3 to check another device.

4.3.1.2 Linux

Get the device location on the PCI bus by running lspci and locating lines with the string "Mellanox Technologies":

```
> lspci  | grep Mellanox

                      2:00.0 InfiniBand: Mellanox Technologies MT26428 [ConnectX VPI PCIe
2.0 5GT/s - IB QDR / 10GigE] (rev b0)
```

Make sure that either the MLNX_OFED driver or the MLNX_EN driver is loaded and configured.

Check the link status

First check the network interface name by running the "`ifconfig -a`" command.

To check the Ethernet link status, for EN only and VPI cards, run: `ethtool <interface>`

```
Host# ethtool  eth1
        Supported ports: [ TP ]
        Supported link modes:   10baseT/Half 10baseT/Full
                                100baseT/Half 100baseT/Full
                                1000baseT/Half 1000baseT/Full
        Supports auto-negotiation: Yes
        Advertised link modes:  10baseT/Half 10baseT/Full
                                100baseT/Half 100baseT/Full
                                1000baseT/Half 1000baseT/Full
        Advertised auto-negotiation: Yes
        Speed: Unknown! (0)
        Duplex: Half
        Port: Twisted Pair
        PHYAD: 1
        Transceiver: internal
        Auto-negotiation: on
        Supports Wake-on: g
        Wake-on: d
        Current message level: 0x000000ff (255)
        Link detected: yes
```

To check the IB link status, for IB and VPI cards, run "`ibstat`" and focus on the Physical state attributes.

Example:

```
Host# ibstat
CA 'mlx4_0'
        CA type: MT26428
        Number of ports: 1
        Firmware version: 2.7.616
        Hardware version: b0
        Node GUID: 0x0002c903000c8710
        System image GUID: 0x0002c903000c8713
        Port 1:
                State: Down
                Physical state: Polling
```

```
Rate: 10
Base lid: 6
LMC: 0
SM lid: 3
Capability mask: 0x0251086a
Port GUID: 0x0002c903000c8711
Link layer: IB
```

Check the OFED version

To get the version of the running Mellanox OFED/BXOFED, run the following command:

```
Host# ofed_info | head -1
BXOFED-1.5.1-1.3.7-rc19:
```

Troubleshooting MLNX_OFED Installation

For troubleshooting driver installation, please check Mellanox OFED driver user manual: http://www.mellanox.com => Support > Adapter IB/VPI SW.

If you need to update your card firmware, download the new firmware.

Unzip the downloaded file and run flint/mstflint command:

```
flint -d <device> -i <fw-file> [-guid <GUID> | -guids <4 GUIDS> | -mac <MAC> | -macs <2 MACs>] burn
```

Check VPI setup – Ethernet / InfiniBand configuration

For Example:

```
flint  -d /dev/mst/mt26428_pci_cr0 –i fw-25408-2_7_000-MNPH28B-XTC_A1-A2.bin burn
```

Loading the Ethernet Driver

By default, the Mellanox OFED stack loads mlx4_en. Run ‘lsmod’ to verify that the module is listed.

Example:

```
Host# lsmod | grep mlx4_en
mlx4_en               109708  0
mlx4_core             136804  2 mlx4_en,mlx4_ib
```

If you don’t see the mlx4_en driver, run: ’ modprobe mlx4_en’

Another option is to use the command below to see which modules are active.

```
Edit ”/etc/infiniband/openib.conf” which modules needs to loaded from a service.
```

For example:

```
# Load MLX4_EN module
MLX4_EN_LOAD=yes
```

The “Usage: openibd {start|stop|restart|status}” command to modify this file and thereby control the drivers.

Ethernet Driver Usage and Configuration

To assign an IP address to the interface run:

```
#> ifconfig eth<n> <ip>
```

where 'n' is the OS assigned interface number.

- To check driver and device information run:

```
#> ethtool -i eth<n>
```

Example:

```
#> ethtool -i eth2
driver: mlx4_en (MT_04A0140005)
version: 1.5.1 (March 2010)
firmware-version: 2.7.000
bus-info: 0000:13:00.0
```

- The mlx4_en parameters can be found under /sys/module/mlx4_en (or /sys/module/mlx4_en/parameters, depending on the OS) and can be listed using the command:

```
#> modinfo mlx4_en
```

To set non-default values to module parameters, the following line should be added to the file/etc/modprobe.conf:

```
"options mlx4_en <param_name>=<value> <param_name>=<value> ..."
```

Ethernet Network Tuning

To improve network perfomance by tuning your network see the Mellanox Performance Tuning Guide located at:

http://www.mellanox.com/related-docs/prod_software/Performance_Tuning_Guide_for_Mellanox_Network_Adapters_rev_1_0.pdf

4.4 Cables and Modules

The SFP+ port can connect to the Ethernet through both direct attach cables and stand alone transceivers with optical cables. SFP+ transceiver modules are available for both SR and LR protocols.

See www.mellanox.com => Products => Cables for certified and approved cable recommendations.

4.4.1 Optical modules for SFP+

SFP+ transceiver modules can be used to connect fiber optic cables to the cards greatly increasing the cable reach.

The adapter cards are shipped without optical modules. Mellanox 10GBASE-SR (MFM1T02A-SR) and 10GBASE-LR (MFM1T02A-LR) optical modules are recommended. The figure below shows the Mellanox SFP+ module.

Inserting the Optical Transceiver Module

To insert the module into the cage:

1. Open the module's locking mechanism – see Figure 11 and Figure 12.
2. Make sure that the male connectors on the module will align with the female connectors inside of the cage. Also check that there is no dirt or foreign matter in the module or in the cage.

Figure 11: Module With Locking Mechanism Closed

Figure 12: Module With Locking Mechanism Open

3. Insert the module into the adapter card module cage.
4. Close the locking Mechanism.

To remove the module from the cage:

1. Unlock the locking mechanism by opening the handle.
2. Pull the module out of the cage.

4.4.2 Cable Installation

All cables can be inserted or removed with the unit powered on. To insert a cable, press the connector into the port receptacle until the connector is firmly seated. The GREEN LED indicator will light when the physical connection is established (that is, when the unit is powered on and a cable is plugged into the port with the other end of the connector plugged into a functioning port). After plugging in a cable, lock the connector using the latching mechanism particular to the cable vendor. When a logical connection is made the YELLOW LED will come on. When data is being transferred the yellow led will blink.

When installing cables make sure that the latches engage.

Always install and remove cables by pushing or pulling the cable and connector in a straight line with the card.

Care should be taken not to impede the air exhaust flow through the ventilation holes. Cable lengths should be used which allow for routing horizontally around to the side of the chassis before bending upward or downward in the rack.

To remove a cable, disengage the locks and slowly pull the connector away from the port receptacle. Both LED indicators will turn off when the cable is unseated.

Cables, especially long copper cables, can weigh a substantial amount. Make sure that the weight of the cable is supported on its own and is not hanging from the adapter card.

Appendix A: Specifications

A.1 MNPH29D-X[ST]R Specifications

Table 10 - Specifications for MNPH29D-X[ST]R

Physical		Power and Environmental	
Size:	2.71in x5.60in (68.90mm x 142.25mm)	Voltage:	12V, 3.3V
Air Flow:	200LFM[a]	Typ. Power:	Passive Cables 6.43W Active Cables 7.83W
10Gb/s Connector:	SFP+	Maximum Power:	Passive Cables 7.08W Active Cables 8.48W
		Temperature:	0°C to 55°C
Protocol Support		Regulatory	
Ethernet:	IEEE Std 802.3ae 10 Gigabit Ethernet IEEE Std 802.3ad Link Aggregation and Failover IEEE Std 802.3x Pause IEEE Std 802.1Q VLAN tags, .1p priorities IEEE Std 802.1p Priorities IEEE P802.1au D2.0 Congestion Notification IEEE P802.1az D0.2 Enhanced Transmission Selection IEEE P802.1bb D1.0 Priority-based Flow ControlMulticast	EMC:	FCC 47 CFR part 15:2007, subpart B class A; ICES-003:2004 issue 4, class A; VCCI V-3/2008.04 class A; AS/NZ CISPR 22-2006, class A. EN 55022:1998 + A1:2000 + A2: 2003 class A, EN 55024:1998 + A1:2001 + A2: 2003 EN 61000-3-2: 2006, EN 61000-3-3: 1995+A1:2001+A2:2005 standards harmonized under EMC Directive 2004/108/EC Article 6(2);
PCI Express	2.0 SerDes @ 5.0 GT/s	Safety:	UL, EU: IEC, TUV, and CB EN 60950-1:2006
		EMI:	CLASS 1 LASER PRODUCT IEC 60 825-1:1993 + A1:1997 + A2:2001 EN 60825-1:1994+A1:1996+ A2:2001”
		RoHS:	RoHS R6

a. Air flow is measured ~1” from the heat sink between the heat sink and the cooling air inlet.

A.2 MNPH29C-X[ST]R Specifications

Table 11 - Specifications for MNPH29C-X[ST]R

Physical		Power and Environmental	
Size:	2.71in x6.60in (68.90mm x 167.65mm)	Voltage:	12V, 3.3V
		Typ. Power:	Passive Cables 6.43W Active Cables 7.83W
Air Flow:	200LFM[a]		
10Gb/s Connector:	SFP+	Maximum Power:	Passive Cables 7.08W Active Cables 8.48W
		Temperature:	0°C to 55°C
Protocol Support		Regulatory	
Ethernet:	IEEE Std 802.3ae 10 Gigabit Ethernet IEEE Std 802.3ad Link Aggregation and Failover IEEE Std 802.3x Pause IEEE Std 802.1Q VLAN tags, .1p priorities IEEE Std 802.1p Priorities IEEE P802.1au D2.0 Congestion Notification IEEE P802.1az D0.2 Enhanced Transmission Selection IEEE P802.1bb D1.0 Priority-based Flow ControlMulticast	EMC:	FCC 47 CFR part 15:2007, subpart B class A; ICES-003:2004 issue 4, class A; VCCI V-3/2008.04 class A; AS/NZ CISPR 22-2006, class A. EN 55022:1998 + A1:2000 + A2: 2003 class A, EN 55024:1998 + A1:2001 + A2: 2003 EN 61000-3-2: 2006, EN 61000-3-3: 1995+A1:2001+A2:2005 standards harmonized under EMC Directive 2004/108/EC Article 6(2);
PCI Express	2.0 SerDes @ 5.0 GT/s	Safety:	UL, EU: IEC, TUV, and CB EN 60950-1:2006
		EMI:	CLASS 1 LASER PRODUCT IEC 60 825-1:1993 + A1:1997 + A2:2001 EN 60825-1:1994+A1:1996+ A2:2001”
		RoHS:	RoHS R6

a. Air flow is measured ~1” from the heat sink between the heat sink and the cooling air inlet.

A.3 Board Mechanical Drawing and Dimensions

All of the cards covered in this *User Manual* have the same mechanical drawing and share the same dimensions as depicted in Figure 13 or Figure 14.

All dimensions are in millimeters.
All the mechanical tolerances are +/-0.1mm

Figure 13: Schematic of the ConnectX-2 Small Form Factor MNPH29D Adapter Card

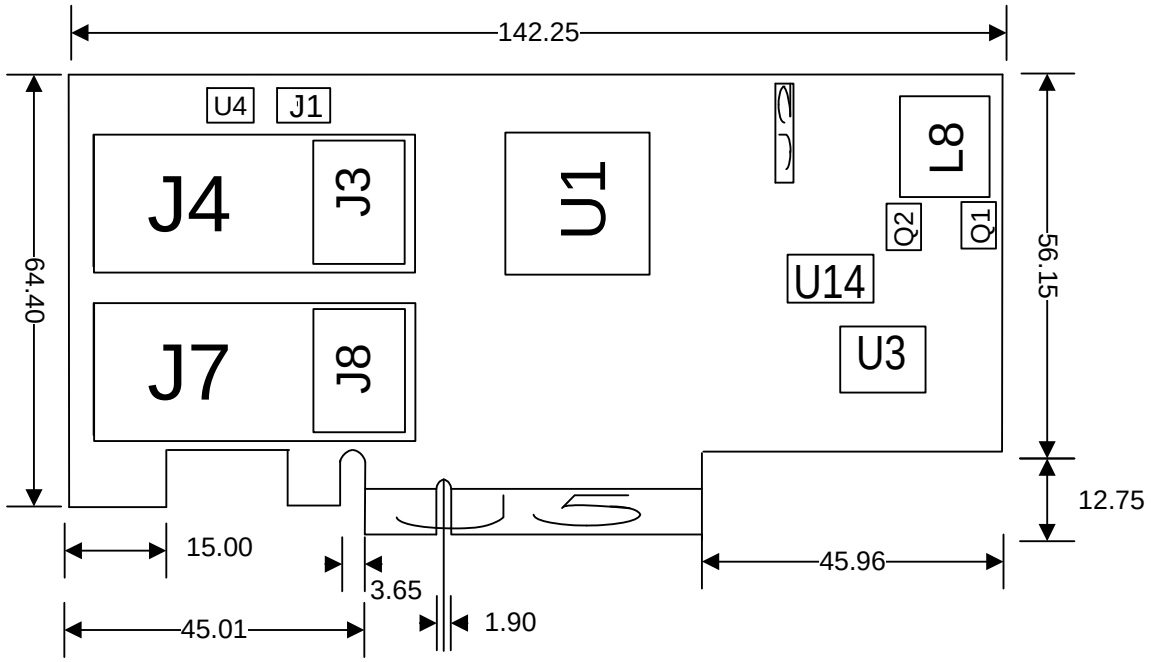
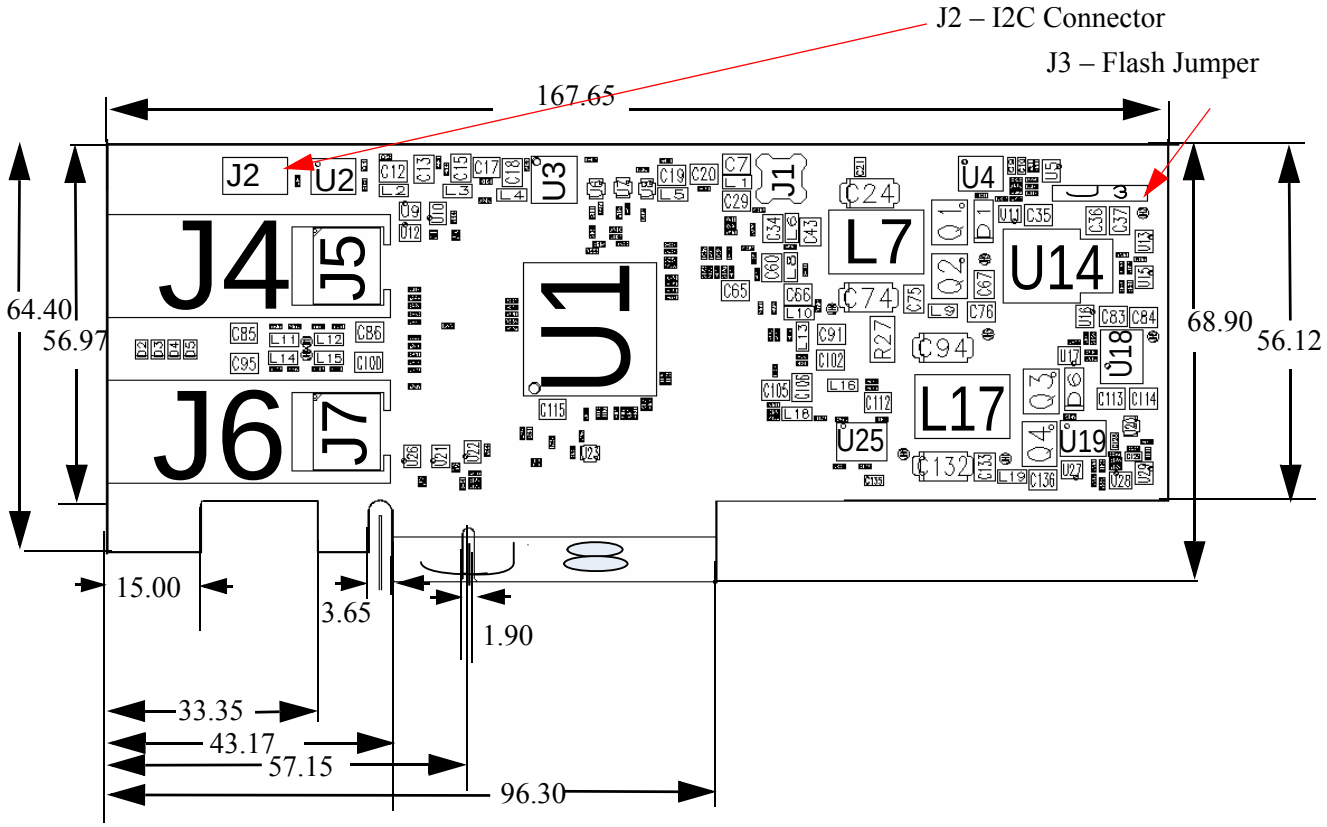


Figure 14: Schematic of the ConnectX-2 Card MNPH29C Adapter Card



A.4 EMC Certification Statements

Table 12 lists the approved certification status per in different regions of the world.

Table 12 - Adapter Cards Certification Status

Adapter Card P/N	FCC	VCCI	EN	ICES	CE	CB	cTUVus	KCC	C-TICK
MNPH29C-XTR	YES	YES	YES	YES	YES	YES	YES	YES	YES
MNPH29C-XSR	YES	YES	YES	YES	YES	YES	YES	YES	
MNPH29D-XTR	YES	YES	YES	YES	YES	YES	YES	YES	YES
MNPH29D-XSR	YES	YES	YES	YES	YES	YES	YES	YES	

A.4.1 FCC Statements (USA)

Class A Statements:

§ 15.19(a)(4)

This device complies with Part 15 of the FCC Rules.

Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

§ 15.21

Statement

Warning!

Changes or modifications to this equipment not expressly approved by the party responsible for compliance (Mellanox Technologies) could void the user's authority to operate the equipment.

§15.105(a)

Statement

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

A.4.2 EN Statements (Europe)

EN55022 Class A Statement:

Warning

This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

A.4.3 ICES Statements (Canada)

Class A Statement:

“This Class A digital apparatus complies with Canadian ICES-003.
Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.”

A.4.4 VCCI Statements (Japan)

Class A Statement:

この装置は、情報処理装置等電波障害自主規制協議会（ＶＣＣＩ）の基準に基づくクラスＡ情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

(Translation - "This is a Class A product based on the standard of the Voluntary Control Council for Interference by Information Technology Equipment (VCCI). If this equipment is used in a domestic environment, radio interference may occur, in which case the user may be required to take corrective actions.")

A.4.5 KCC Certification (Korea)

English Translation

Device	User's information
A급 기기 (업무용 방송통신기기)	이 기기는 업무용(A급)으로 전자파적합등록을 한 기기이오니 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.
CLASS A device (commercial broadcasting and communication equipment)	This device has been approved by EMC registration. Distributors or users pay attention to this point . This device is usually aimed to be used in other area except at home .

- Remark

Class A device: operated in a commercial area.

Appendix B: Interface Connectors Pinout

B.1 I²C-Compatible Connector Pinout

Figure 15: Compatible Connector Plug and Pinout

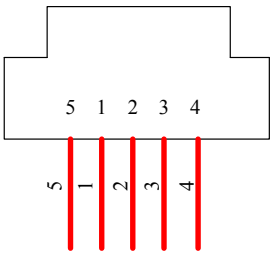


Table 13 - I2C-Compatible Connector

Connector Pin Number	Signal Name
1	SPSDA
2	SPSCL
3	GND
4	NC
5	NC

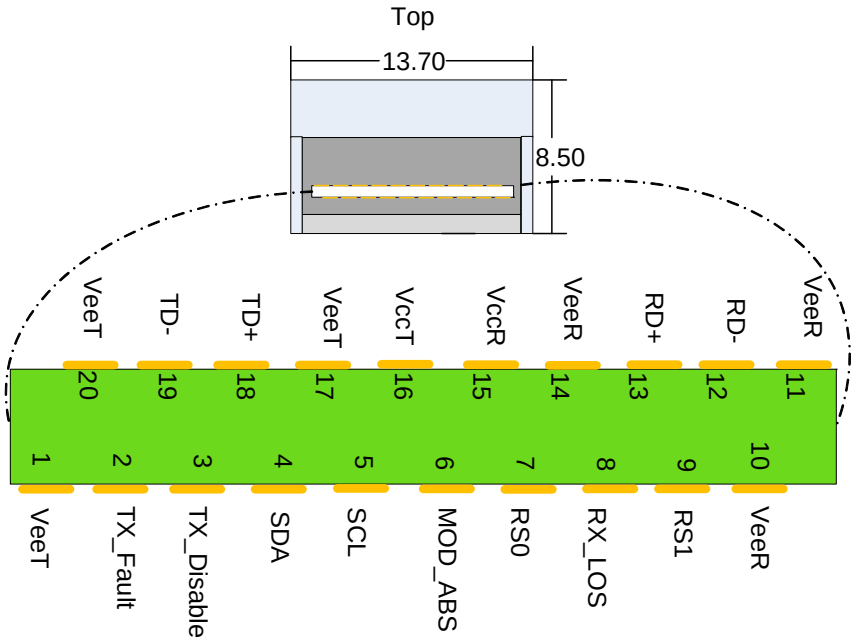
B.2 PCI Express x8Connector Pinout

These cards use a standard PCI Express x8 edge connector and the PCI Express x8 standard pinout according to the PCI Express 2.0 specification.

B.3 PCI Express Connector Pinout

B.4 SFP+ Connector Pinout

Figure 16: Rear View of Module With Pin Placement



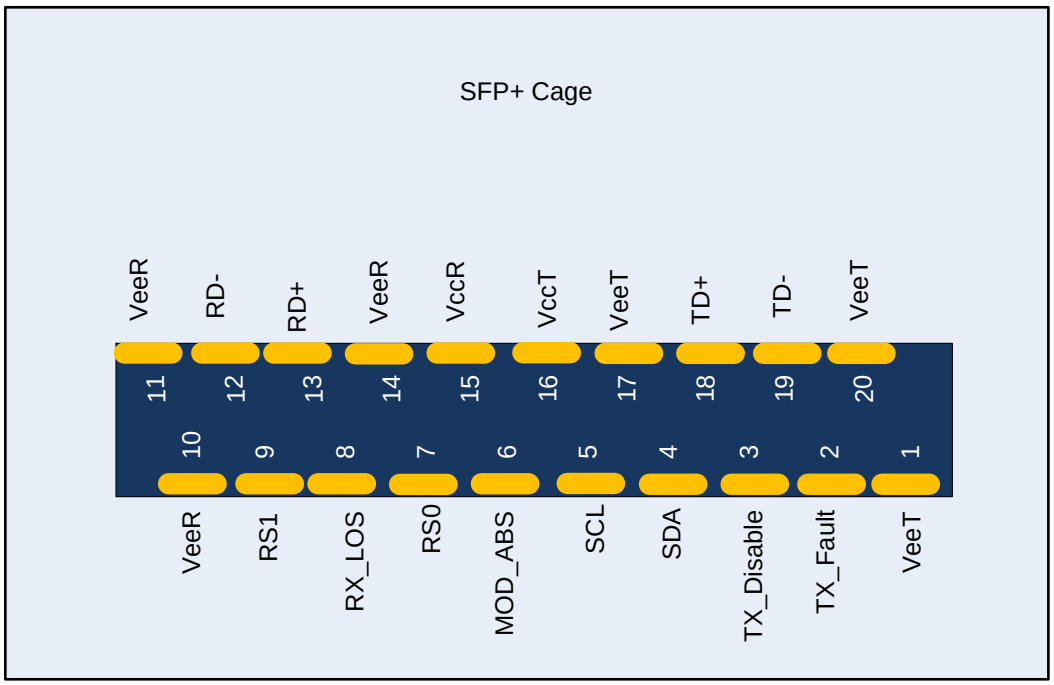


Table 14 - SFP+ Connector Pinout

Pin	Symbol Name	Description
1	VeeT	Transmitter Ground (Common with Receiver Ground) [a]
2	TX_Fault	Transmitter Fault.[b]
3	TX_Disable	Transmitter Disable. Laser output disabled on high or open. [c]
4	SDA	2-wire Serial Interface Data Line [d]
5	SCL	2-wire Serial Interface Clock Line [d]
6	MOD_ABS	Module Absent. Grounded within the module [d]
7	RS0	No connection required
8	RX_LOS	Loss of Signal indication. Logic 0 indicates normal operation. [e]
9	RS1	No connection required
10	VeeR	Receiver Ground (Common with Transmitter Ground) [a]
11	VeeR	Receiver Ground (Common with Transmitter Ground)[a]
12	RD-	Receiver Inverted DATA out. AC Coupled
13	RD+	Receiver Non-inverted DATA out. AC Coupled
14	VeeR	Receiver Ground (Common with Transmitter Ground) [a]
15	VccR	Receiver Power Supply
16	VccT	Transmitter Power Supply
17	VeeT	Transmitter Ground (Common with Receiver Ground) [a]
18	TD+	Transmitter Non-Inverted DATA in. AC Coupled.
19	TD-	Transmitter Inverted DATA in. AC Coupled.
20	VeeT	Transmitter Ground (Common with Receiver Ground)[a]

a. Circuit ground is internally isolated from chassis ground.
b. T_{FAULT} is an open collector/drain output, which should be pulled up with a 4.7k – 10k Ohms resistor on the host board if intended for use. Pull up voltage should be between 2.0V to Vcc + 0.3V. A high output indicates a transmitter fault caused by either the TX bias current or the TX output power exceeding the preset alarm thresholds. A low output indicates normal operation. In the low state, the output is pulled to <0.8V.
c. Laser output disabled on TDIS >2.0V or open, enabled on TDIS <0.8V
d. Should be pulled up with 4.7kΩ – 10kΩ on host board to a voltage between 2.0V and 3.6V. MOD_ABS pulls line low to indicate module is plugged in.
e. LOS is open collector output. Should be pulled up with 4.7kΩ – 10kΩ on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.

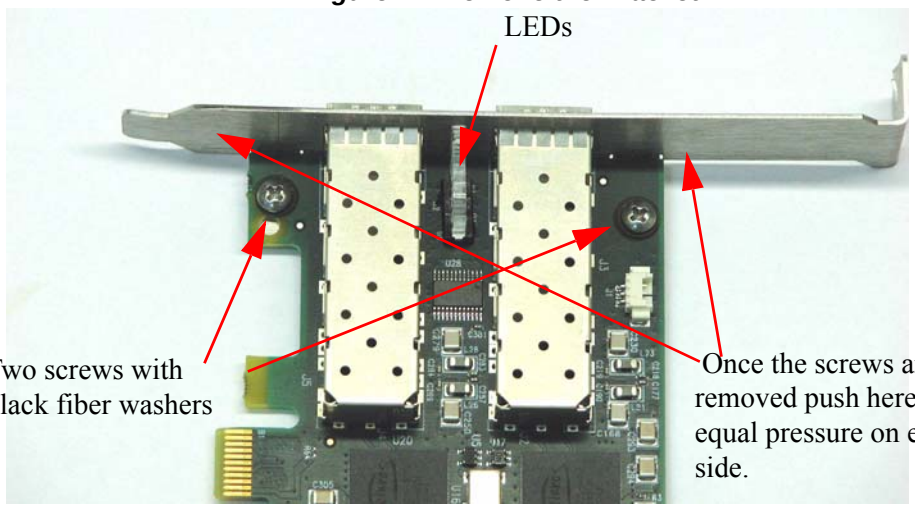
Appendix C: Replacing a Tall Bracket With a Short Bracket

This section provides instructions on how to remove the tall bracket of a standard Mellanox Technologies adapter card and replace it with a short one. It includes the following sections:

- Removing a bracket
- Installing a new bracket

C.1 Remove the Existing Bracket from the Adapter Card

Figure 17: Remove the Bracket



1. Remove the two screws holding the bracket in place.
2. Push the bracket off using equal pressure at the top and bottom of the bracket. See Figure 17

Be careful not to put stress on the LEDs.

3. Save the two screws and the two fiber washers.

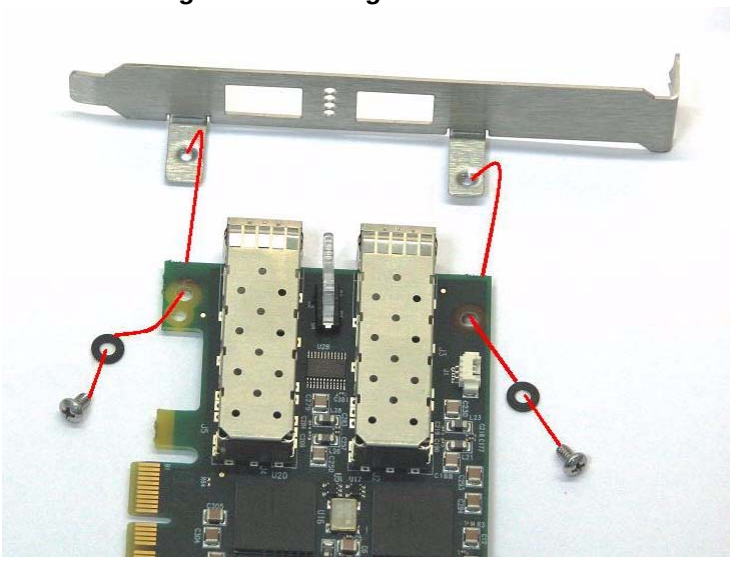
C.2 Installing the New Bracket

4. Place the bracket onto the card until the screw holes line up.

Do not force the bracket onto the card. You may have to gently push the LEDs using a small screwdriver to align the LEDs with the holes in the bracket.

5. Screw on the bracket using the screws and washers saved from the procedure above step 1.

Figure 18: Putting on the Bracket



6. Make sure that the LEDs are aligned onto the bracket holes.
7. Use a torque driver to apply up to 2 lbs-in torque on the screws.

Appendix D: Avertissements de sécurité d'installation (Warnings in French)

1. Instructions d'installation

Lisez toutes les instructions d'installation avant de brancher le matériel à la source d'alimentation électrique.

2. Température excessive

Ce matériel ne doit pas fonctionner dans une zone avec une température ambiante dépassant le maximum recommandé de 55°C (131°F). Un flux d'air de 200LFM à cette température ambiante maximale est nécessaire. En outre, pour garantir un bon écoulement de l'air, laissez au moins 8 cm (3 pouces) d'espace libre autour des ouvertures de ventilation.

3. Orages – dangers électriques

Pendant un orage, il ne faut pas utiliser le matériel et il ne faut pas brancher ou débrancher les câbles.

4. Branchement/débranchement des câbles InfiniBand en cuivre

Les câbles InfiniBand en cuivre sont lourds et ne sont pas flexibles, il faut donc faire très attention en les branchant et en les débranchant des connecteurs. Consultez le fabricant des câbles pour connaître les mises en garde et les instructions spéciales.

5. Installation du matériel

Ce matériel ne doit être installé, remplacé ou entretenu que par du personnel formé et qualifié.

6. Elimination du matériel

L'élimination de ce matériel doit s'effectuer dans le respect de toutes les législations et réglementations nationales en vigueur.

7. Codes électriques locaux et nationaux

Ce matériel doit être installé dans le respect des codes électriques locaux et nationaux.

Appendix E: Sicherheitshinweise (Warnings in German)

1. Installationsanleitungen

Lesen Sie alle Installationsanleitungen, bevor Sie das Gerät an die Stromversorgung anschließen.

2. Übertemperatur

Dieses Gerät sollte nicht in einem Bereich mit einer Umgebungstemperatur über der maximal empfohlenen Temperatur von 55°C (131°F) betrieben werden. Es ist ein Luftstrom von 200 LFM bei maximaler Umgebungstemperatur erforderlich. Außerdem sollten mindestens 8 cm (3 in.) Freiraum um die Belüftungsöffnungen sein, um einen einwandfreien Luftstrom zu gewährleisten.

3. Bei Gewitter - Elektrische Gefahr

Arbeiten Sie während eines Gewitters und Blitzschlag nicht am Gerät, schließen Sie keine Kabel an oder ab.

4. Anschließen/Trennen von InfiniBand-Kupferkabel

InfiniBand-Kupferkabel sind schwer und nicht flexible. Deshalb müssen sie vorsichtig an die Anschlüsse angebracht bzw. davon getrennt werden. Lesen Sie die speziellen Warnungen und Anleitungen des Kabelherstellers.

5. Geräteinstallation

Diese Gerät sollte nur von geschultem und qualifiziertem Personal installiert, ausgetauscht oder gewartet werden.

6. Geräteentsorgung

Die Entsorgung dieses Geräts sollte unter Beachtung aller nationalen Gesetze Bestimmungen erfolgen.

7. Regionale und nationale elektrische Bestimmungen

Dieses Gerät sollte unter Beachtung der regionalen und nationalen elektrischen Bestimmungen installiert werden.

Appendix F: Advertencias de seguridad para la instalación (Warnings in Spanish)

1. Instrucciones de instalación

Antes de conectar el equipo a la fuente de alimentación, leer todas las instrucciones de instalación.

2. Sobrecalentamiento

No se debe utilizar el equipo en un área con una temperatura ambiente superior a la máxima recomendada: 55°C(131°F). Además, para garantizar una circulación de aire adecuada, se debe dejar como mínimo un espacio de 8 cm (3 pulgadas) alrededor de las aberturas de ventilación.

3. Cuando hay rayos: peligro de descarga eléctrica

No utilizar el equipo ni conectar o desconectar cables durante períodos de actividad de rayos.

4. Conexión y desconexión del cable Copper InfiniBand

Dado que los cables de cobre InfiniBand son pesados y no son flexibles, su conexión a los conectores y su desconexión se deben efectuar con mucho cuidado. Para ver advertencias o instrucciones especiales, consultar al fabricante del cable.

5. Instalación de equipos

La instalación, el reemplazo y el mantenimiento de este equipo estarán a cargo únicamente de personal capacitado y competente.

6. Eliminación de equipos

La eliminación definitiva de este equipo se debe efectuar conforme a todas las leyes y reglamentaciones nacionales.

Códigos eléctricos locales y nacionales

Este equipo se debe instalar conforme a los códigos eléctricos locales y nacionales.